James R. Herman Cruise Terminal & Northeast Wharf Plaza Project

Draft Stormwater Control Plan

Supplemental Practicability Analysis

12/22/11

Prepared by:
Port of San Francisco
Richard Berman
Pier 1, San Francisco, CA, 94111

Post-Construction Stormwater Supplemental Practicability Analysis

The site of the proposed Cruise Terminal at Pier 27 currently discharges stormwater directly into the Bay. The proposed project includes five major surface areas that require consideration for designing stormwater controls: the new Cruise Terminal Building, the Ground Transportation Area, the Northeast Wharf Plaza, the Eastern Apron, and the North Park.

The Cruise Terminal Building will occupy almost 11% of the site area and will include a rainwater harvesting system to control stormwater. The Northeast Wharf Plaza will also occupy about 11% of the site and will be a mostly vegetated surface that provides stormwater control through biofiltration. Stormwater control for the Ground Transportation Area and the North Park is expected to be a blended approach including drainage with media filters and planter filters. The Eastern Apron will receive limited vehicular traffic and the practicability of providing stormwater control is analyzed in the document below. These design considerations will be incorporated into a more detailed Stormwater Control Plan in accordance with the state requirements in the General Permit for Discharges of Stormwater from Small Municipal Storm Sewer Systems (General Permit), Article 4.2 of the San Francisco Public Works Code, and Section 106A.3.2.4 of the Port of San Francisco Building Code.

The analysis below provides a supplement to the original 27-29 SCP outline. Specifically, this document provides a practicability analysis regarding Piers 27/29, which focuses on the practicability of incorporating additional LID BMPs in areas where shallow treatment filters are currently proposed, especially in the North Park, Ground Transportation Area, and adjacent to the ingress and egress locations. The analysis provides: (1) a revised total of replaced impervious surface that will need to be treated for the this area; (2) provided additional detail regarding total treated areas; (3) the specific LID BMPs assessed; (4) potential BMP locations evaluated; and (4) a description any logistical, technical or cost constraints. In addition, information is presented regarding additional components of the project that reduce pollutant loads associated with the quantity of stormwater.

TABLE 1 – EXISTING CONDITIONS

Area Type	Drainage Description	Treated	Not Treated	Area (SF)	Area (Acres)	Percentage
Site Hardscape (Overland)	Stormwater runs off s sheet flow to the edge of the deck and drains directly into the Bay..		x	72,510	1.665	14.0%
Site Hardscape (Valley)	Stormwater runoff drains directly to the Bay through 4" drain holes.		x	195,344	4.484	37.7%
Shed Building	Stormwater runoff drains directly to the Bay through roof water leaders.		x	250,509	5.751	48.3%
TOTAL				**518,363**	**11.900**	**100%**

Table 2 provides an overview of the various components of the proposed conditions and a breakdown of the areas of replaced impervious surfaces that require treatment.

TABLE 2 – PROPOSED SITE COMPONENTS & AREAS OF REPLACED IMPERVIOUS SURFACES

DESCRIPTION	AREA			REPLACED IMPERVIOUS SURFACES (That Require LID Treatment)	AREAS THAT DO NOT REPLACE IMPERVIOUS SURFACES
	sf	Acres	%		
GTA – Lower Level	115,870	2.660	22.4	25,775	90,095
GTA – Upper Level	15,003	0.344	2.9	15,003	--
GTA – TOTAL	**130,873**	**3.004**	**25.2**	**40,778**	**90,095**
North Park – TOTAL	**127,152**	**2.939**	**24.5**	**107,194**	**19,958**
Northeast Wharf Plaza – (Paved)	100,419	2.321	19.4	81,640	18,779
Northeast Wharf Plaza – (Vegetated)	52,823	1.354	10.2	--	52,823
Northeast Wharf Plaza - TOTAL	**153,242**	**3.675**	**29.6**	**81,640**	**71,602**
Eastern Apron - TOTAL	**51,052**	**1.172**	**9.8**	**--**	**51,052**
Terminal Building - TOTAL	**56,044**	**1.124**	**10.8**	**56,044**	**--**
SITE TOTALS	**518,363**	**11.9**	**100**	**285,656**	**232,707**

There will be no new impervious surface associated with the proposed project. Actually, the site will involve the reduction of approximately 1.35 acres of impervious surface due to the creation of two new open space areas. The existing soccer field is a temporary installation of artificial turf that sits atop impervious pavement with 4" drain holes. The field does not function as a pervious surface, but rather sheetflows to the pavement and then to the drain holes. The field is, accordingly, not treated as a pervious surface in this analysis.

In calculating the area of replaced impervious surface that will require treatment on Piers 27-29 as a result of the proposed project, the Project Sponsor used the California Municipal Regional Stormwater

NPDES Permit (MRP) (R2-2009-0074). Section C.3(b)(ii)(3), which excludes from post construction control treatment requirements:

Routine maintenance or repair such as:

- roof or exterior wall surface replacement, or
- pavement resurfacing within the existing footprint.

The SF RWQCB staff further clarified that this exemption would apply to simple surface work like filling in pot holes, leveling pavement, etc, that does not involve major removal of surface and replacement of surface. For Piers, this would include surface leveling work (similar to filling potholes on streets, leveling roads, leveling to improve treatment, etc) that does not involve any substructure improvement.

Pollutants of Concern associated with Cruise Terminal Use:

- Sediment
- Oils/Grease
- Metals
- Trash

Overview Constraints and Opportunities

Most of the site is a pier over water that inherently limits the opportunity to use many of the low-impact development best management practices from the SF Stormwater Design Guidelines. Structural requirements limit the additional weight that can be added to the concrete deck. This restricts storage/retention opportunities as well as the options to regrade and redirect drainage. Cutting into or opening the pier deck will also compromise the structural integrity of the pier and is generally limited to an allowable opening of 24”x24” without additional structural supports. Utilization of the space under the pier deck is limited by space and conditions. The area is subject to large swells and the high-tide clearance between the water surface and the bottom of the deck is only six feet, which restricts the placement and maintenance of equipment and infrastructure such as piping, pumps, and cisterns. Moreover, the under pier environment is harsh due to corrosion and debris and this shortens the lifespan of equipment and infrastructure. Finally, Piers 27-29 are within the Embarcadero Historic District. Accordingly, any Low Impact Design (LID) designs proposed would need to be consistent with the existing character of the Historic District. This constraint was included in the Environmental Impact Report that was approved by the San Francisco Planning Commission and Port Commission. See additional detail provided below under the biofiltration planter discussion.

As discussed in previous submittals, the most notable opportunity for LID is the development of the new Cruise Terminal Building. This presents the opportunity to design new spaces, including the roof area that will facilitate the introduction of LID. In particular, the seismic retrofitting to support the building can be designed to accommodate rainwater harvesting and storage.

General Site Constraints:

The following site constraints apply to the all or most of the entire site and are treated as general site constraints.

- No soil, cannot infiltrate
- Load bearing/seismic constraints
- Cannot site anything around edge of pier due to boating/fishing/public access, or extend out from pier due to shading, bay infill issues
- Within the Embarcadero Historic District as reflected in the adopted findings of the EIR.

Area-Specific Constraints:
Some portions of the site have specific constraints that are addressed below.

- **North Park -** The North Park does not have sufficient natural grade to facilitate gravity flow to bioretention features or other LID features. This would require either significant seismic reinforcement to accommodate the additional paving and cutting into the deck, or the inclusion of under-pier piping and pumps to collect and convey the stormwater to the LID feature. Most of the North Park area is essential to provisioning activities when cruise ships are berthed. Jointly, these constraints are significant.

- **Ground Transportation Area -** Portions of the GTA have insufficient grade to rely on gravity flow to direct stormwater runoff to centralized LID features. Altering the grade to create gravitational flow would require repaving such large quantities of asphalt that the current structural capacity of the pier deck would be exceeded, thus requiring structural upgrades. Alternatively, a mechanical conveyance of pipes and pumps would be introduce the challenge of maintaining under-pier infrastructure that is exposed to corrosion and debris from high tides and large swells. Most of the GTA facilitates vehicular movement when cruise ships are at berth and this restricts the above deck areas that are available for LID. Existing opportunities are presented in the next section.

- **Areas of Ingress and Egress –** The area near the Embarcadero serves as the only point of vehicular entry to the site. It is also a located adjacent to the bulkhead of Pier 29. Although specific uses are not referenced on site drawings, this is a critical location for the site complex including security and emergency access as well as general provisioning and warehouse support activities. The design team has determined that this is a significant enough constraint that it is unsuitable for placement of LID features.

See the table below for additional constraints associated with each BMP that could be applied to these three areas.

Site Opportunities:

- **North Park** – There may be potential to place a bioretention feature on the western side of this area to provide additional treatment. This would take advantage of the area that is not required for provisioning cruise ships. To avoid seismic upgrades it would, however, require under-pier piping and pumps and would potentially conflict with the Historic Embarcadero District and the related findings in the adopted EIR.

- **Ground Transportation Area (GTA) –** The upper GTA is benefits from natural grade that will facilitate gravitational flow to LID features such as a bioretention flow through planter.

- **Areas of Ingress and Egress –** On some current site drawings the ingress egress area appears to be unused and an opportunity for installing additional LID. This is misleading as discussed above. The design team has determined this area is unsuitable for the installation of additional LID.

- **New Landscaped Area-** While this was not identified in the RWQCB's December 15, 2011 letter, there is an opportunity to create another vegetated park area just east of the Ground Transportation Area. This area has been evaluated and another park has been incorporated into the Site Plan. See Table 5 below for the level of treatment provided by this area of new pervious surface.

BMP Selection:

The BMP selection process consists of two steps: determining which BMPs fit best on the site given the site conditions and site plan, and selecting those BMPs best suited to treat the pollutants of concern. The SDG recommends 7 BMPs suited for use on a pier over water:

1. Rain Gardens (Bioretention)
2. Cistern for Rainwater Harvesting
3. Detention Pond
4. Vegetated Pontoons
5. Above Ground Planter for Biofiltration
6. Trench Drains for Conveyance
7. Vortex/Swirl Separator or Media Filter

TABLE 3: Matching the site constraints/opportunities:

1. Rain Gardens in the Streetscape (Bioretention)	Rain gardens are a special case of bioretention in the San Francisco Stormwater Design Guidelines, which is considered in item 5 as Above Ground Planters for Biofiltration.
2. Cistern for Rainwater Harvesting	Incorporated as part of the rainwater harvesting; additional use of cisterns is infeasible for several reasons. There are no other above-deck collection opportunities that facilitate rainwater harvesting and gravity flow delivery to a cistern. Additionally, structural reinforcing of the pier would be required to support the added weight.
3. Detention Pond	Eliminated for further study because there is limited space given the proposed future use of the site and potential seismic/structural issues with storing water
4. Vegetated Pontoons for Biofiltration	Eliminated for further study because there are public access issues with limiting public access to the edges of the pier
5. Above Ground Planters for Biofiltration	Merits further consideration/combine in the North Park area; however, there are significant logistical constraints associated with this BMP on 27-29. As identified above, these Piers are adjacent to the Embarcadero Historic District and a concern was raised in the AC34 CEQA document to avoid altering the look of the Piers. Since this area would have to be above deck, it would be visible from the Embarcadero. In addition, additional utilities would be required to pump the water up and into these above ground planters. That said, the Project Sponsor has kept this potential BMP into the analysis as part of Alternative #2 below to provide a comprehensive analysis.
6. Trench Drains for Conveyance	Eliminated for further study because it is preferable to use existing drainage patterns than construct additional temporary utilities
7. Vortex/Swirl Separator or Media Filter	Merits further consideration

New Technology Selection and the MEP Standard:

After receiving the RWQCB's December 15, 2011 letter, the Port had further discussions with the San Francisco Public Utilities Commission (SFPUC) about the choice of technologies for treating drainage through the pier deck when constrained by grade and structural considerations. The SFPUC acknowledged that many filter technologies fall short of the standard of Maximum Extent Practicable (MEP). Upon further review the SF PUC determined that the original project proposed a catch basin treatment that is best understood as a Drain Insert, as described in the SF Stormwater Design Guidelines. As such, the SFPUC determined that this does not meet the MEP standard. As an alternative the SFPUC has recommended a Media Filter technology that uses a cartridge filter. Though not a preferred form of BMP or LID, it is considered a superior form of treatment than the Drain Insert and has been allowed by the SFPUC when projects have shown to have significant constraints. This is also consistent with the SF SDG approach to piers over water. To date, the most common Media Filter

allowed by SFPUC are units with cartridge filters containing a specified media to capture the surface runoff pollutants. In general, Media Filters are encouraged to be designed as part of a treatment train to reduce maintenance, however are not required. [See Attachment 1 for specifications of this Filter]. These updated media filters are included as the revised proposal in Alternatives #2 & 3 below.

Based on the proposed site plan, the pollutants of concern, the two BMPs worth further consideration to help treat the areas at the North Park, GTA and Ingress/Egress are above grade bioretention planters (designed to function similar to the combination of a lined rain garden and biofiltration planter) and media filters. Note that as discussed above, the proposed bioretention planter would need to be above ground, which would require additional utilities as well as potentially be inconsistent with the adjacent Embarcadero Historic District requirements.

The following provides an overview of the resulting alternative proposals. All of these alternatives include the following three components that were part of the original proposal:

1. Northeast Wharf Plaza – Bioretention
2. Upper Ground Transportation – Flow Thru Planters
3. Rainwater Harvesting

The only variables changed in the alternatives below are methods for treating the remaining areas of impervious surface (43%) that will not be treated by the components above. The alternatives are described by methods of treatment for each component area.

TABLE 4 – ALTERNATIVES SUMMARY

	ALTERNATIVE 1	**ALTERNATIVE 2**	**ALTERNATIVE 3**
Northeast Wharf Plaza	Bioretention	Bioretention	Bioretention
Rainwater Harvesting	Cruise Terminal Building	Cruise Terminal Building	Cruise Terminal Building
Upper Ground Transportation Area	Flow Thru Planters	Flow Thru Planters	Flow Thru Planters
North Park-Western Edge	Drain Insert Filters	Bioretention*	Updated Media Filters
North Park – Eastern Edge	Drain Insert Filters	Updated Media Filters	Updated Media Filters
GTA	Drain Insert Filters	Updated Media Filters	Updated Media Filters

*See constraint issues above related to this issue.

Based on the above, approximately 285,656 (sf) of replaced impervious site will need to be treated at 27-29. Table 5 below provides a calculation of treatment proposed for each alternative.

TABLE 5 – ALTERNATIVES AND REPLACED IMPERVIOUS SURFACE ANALYSIS

	Alternative 1 Original Proposal (square feet)	**Alternative 2** Bioretention in North Park and Upgraded Media Filters (square feet)	**Alternative 3** Upgraded Media Filters (square feet)
Site Total	518,363	518,363	518,363
Areas of Replaced Impervious Surface	**285,656**	**285,656**	**285,656**
Rainwater Harvesting - (P3)	56,044	56,044	56,044
Bioretention Flow Thru Planter - North of GTA -(P2)	15,003	15,003	15,003
Bio Media Filtration - At Northeast Wharf Plaza`	52,823	52,823	52,823
Bioretention at North Park (Western Edge)*	0	114,362	0
Catch Basin with Filter Inserts - Original Technology (calculate 50% of total area treated)	197,247	0	0
Catch Basin with Media Filter Inserts - New Technology (calculate 100% of total area treated)	0	280,131	394,493
TOTAL OF TREATED AREA (FILTERS = 100% CREDIT)	NA	**518,363**	**518,363**
TOTAL OF TREATED AREA (FILTERS = 75% CREDIT)	NA	**448,330**	**419,740**
TOTAL OF TREATED AREA (FILTERS = 50% CREDIT)	**321,117**	**378,298**	**321,117**

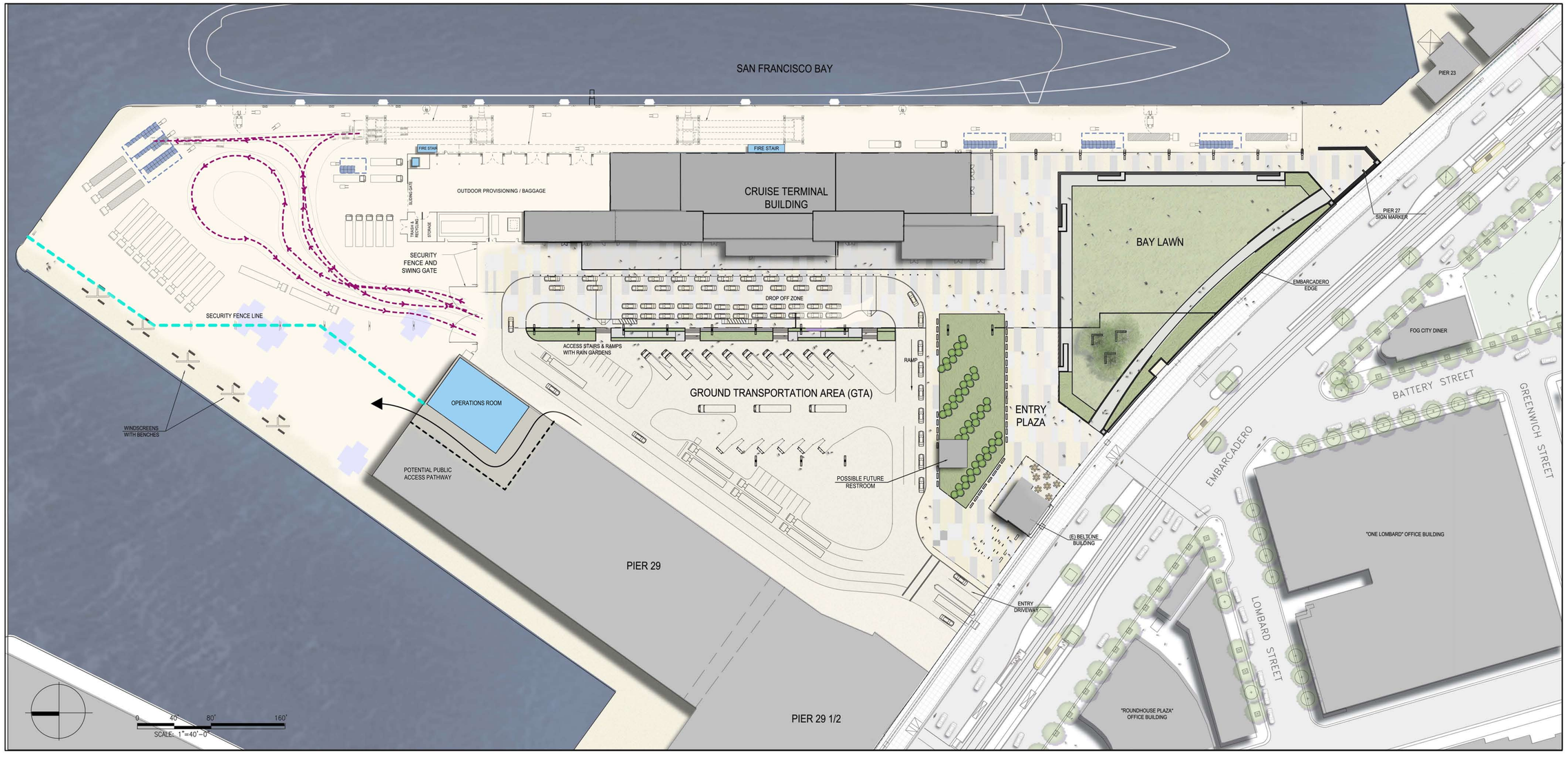
To acknowledge the RWQCB's stated concern with using media filters to meet the MEP, Table 5 includes calculation treatment at 50%, 75% and 100%. At all levels, the proposed Alternative #3 would provide full treatment for all replaced impervious surface. The proposed media filter will serve a larger area than that which is included in the treatment calculation. In addition, the project will include two new vegetated open space areas (pervious surface) that will replace impervious surface. These areas have been included in the onsite treatment calculations as onsite offsets to replaced impervious surface.

The project includes two components that will reduce pollutant loads associated with the quality of stormwater. The Project Sponsor proposes to remove Pier ½ as fill removal mitigation, which will be the equivalent of removing approximately 21,187 sq ft of deck (impervious surface) over water. In addition, the Project Sponsor proposes to extend a 900 x 15 ft bioswale to provide treatment to a portion of an approximately 90,000 sq ft parking lot at the Marina Green. This work is being proposed as part of the AC 34 project to help offset stormwater and to provide an additional public benefit pursuant to BCDC's guidelines. These components of the project are in the early stages of development. Collectively, these areas could provide up to an additional 101,187 sq ft of treatment offsets at offsite locations along the San Francisco waterfront.

Additional Constraints for Each Alternative:

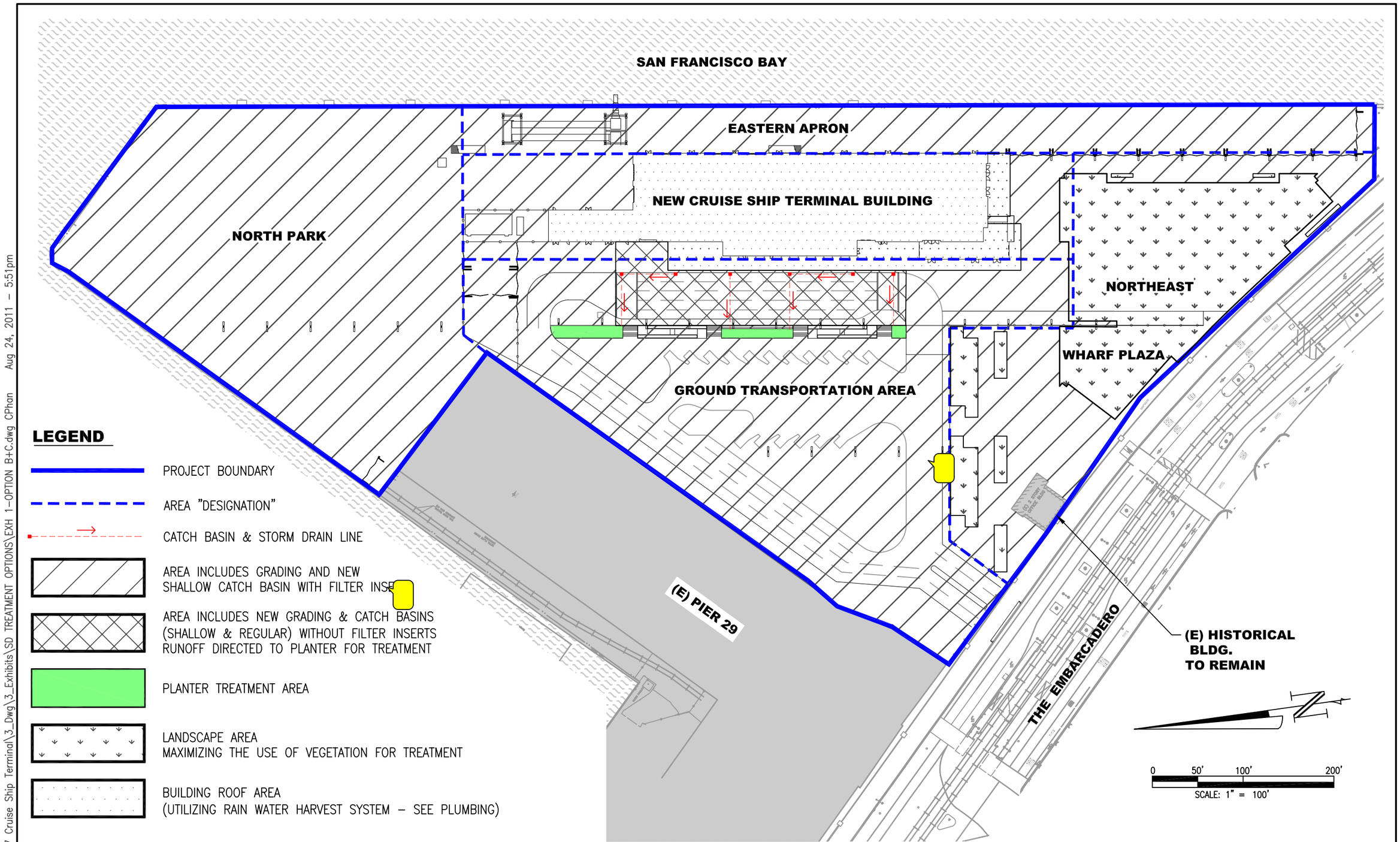
As identified above, Alternative 2 would provide the highest LID features, in particular, the additional bioretention feature at the North Park. However, as identified above, this bioretention planter would need to be placed above grade, which would require the addition of under-pier piping with pumps. The placement of this feature would need to be balanced against the well documented challenges of accessing and maintaining under-pier infrastructure in a difficult setting. In addition, an above grade planter might be inconsistent with the adjacent Embarcadero Historic District and the findings in the AC 34 CEQA document.

Accordingly, the most practicable and preferred proposal is Alternative #3, which would include LID features such as Rainwater Harvesting, Bioretention (Northeast Wharf Plaza) and flow-thru planters (Upper GTA), along with proper media filters in other areas to treat the entire site. This alternative would provide full treatment for the area of proposed replacement impervious surface associated with the Cruise Terminal project.



PIER 27 JAMES R. HERMAN CRUISE TERMINAL

Landscape Architecture Section
City and County of San Francisco



P:\09022.100 Pier 27 Cruise Ship Terminal\3_Dwg\3_Exhibits\SD TREATMENT OPTIONS\EXH 1-OPTION B+C.dwg CPhan Aug 24, 2011 - 5:51pm

TELAMON
ENGINEERING CONSULTANTS, INC.
855 FOLSOM STREET, SUITE 142
SAN FRANCISCO, CA 94107
TEL: 415-837-1336 FAX: 415-837-1354

DESIGNED CP	DATE	DATE AUGUST 24, 2011	PORT OF SAN FRANCISCO PIER 27 CRUISE SHIP TERMINAL
DRAWN CP	DATE	SCALE 1"=100'	STORM WATER TREATMENT OPTION B+C
CHECKED MC	DATE		DRAWING NO. EXH-1A

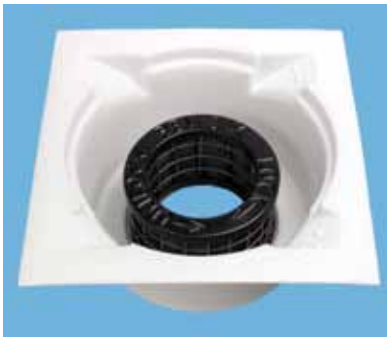
TRITON CATCH BASIN INSERTS

Triton Drop Inlet

The Triton Drop Inlet insert traps hydrocarbons and other contaminants such as metals sand and silt from stormwater runoff. It is installed below the grate of storm drain inlets.

Specifications

- Easy to install in new and existing catch basins
- Meets best available technology for use in stormwater best management practices (BMP)
- Round, square, rectangular, low profile and custom models
- Non-reactive high density polyethylene (HDPE) plastic construction, with U.V. inhibitors
- Media-Pak cartridges available for the removal of sediments, hydrocarbons, and litter
- Quick and easy servicing made available by replaceable Media-Paks



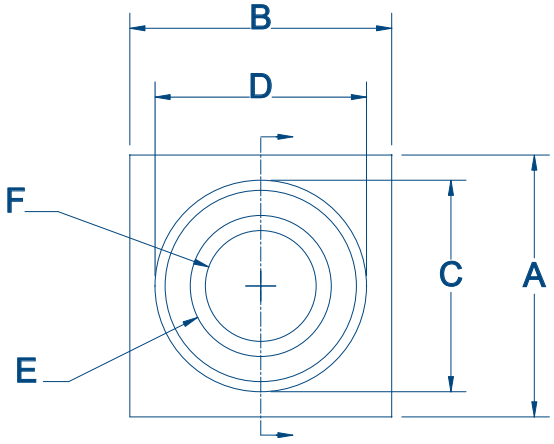
Standard Dimensions (in inches)

Model #	A*	B*	C	D	E	F	G**	# cartridges	H***	Basin Type
TR1212	15.0	15.0	11.0	11.0	6.75	3.50	6.0	1 Short	4.5	HDPE
TR12RD	Ø15.0		Ø11.0		6.75	3.5	6.0	1 Short	4.5	HDPE
TR1616	20.0	20.0	14.0	14.0	6.75	3.5	10.5	1 Std	8.5	HDPE
TR16RD	Ø20.0		Ø11.0		6.75	3.5	6.0	1 Short	4.5	HDPE
TR1818	24.0	24.0	18.0	18.0	10.0	6.25	10.5	1 Std	8.5	HDPE
TR18RD	Ø24.0		Ø16.5		6.75	3.5	10.5	1 Std	8.5	HDPE
TR1824	19.0	25.0	18.0	18.0	10.0	6.25	10.5	1 Std	8.5	HDPE
TR2024	21.0	25.0	18.0	18.0	10.0	6.25	10.5	1 Std	8.5	HDPE
TR24SR	27.0	27.0	23.5	23.5	14.0	10.0	13.0	1 Std	8.5	HDPE
TR24RD	Ø28.0		Ø21.0		14.0	10.0	13.0	1 Std	8.5	HDPE
TR2436	32.0	40.0	22.0	29.0	14.0	10.0	21.0	1 Tall	16.5	HDPE
TR3030	34.0	34.0	22.0	29.0	14.0	10.0	21.0	1 Tall	16.5	HDPE
TR36SR	36.0	36.0	33.0	33.0	14.0	10.0	22.0	1 Tall	16.5	FIBRG
TR36RD	Ø36.0		Ø33.0		14.0	10.0	22.0	1 Tall	16.5	FIBRG
TR42RD	Ø42.0		Ø33.0		14.0	10.0	22.0	1 Tall	16.5	FIBRG
TR4848	48.0	48.0	42.0	42.0	24.0	19.75	22.0	1 Tall	17.5	FIBRG
TR48RD	Ø48.0		Ø33.0		14.0	10.0	22.0	1 Tall	16.5	FIBRG

* Dimenions "A" and "B" can be adjusted to suit varying sizes of each basins.
** Dimension "G" is basin depth.
*** Dimension "H" is cartridge height.

Notes:

1. All dimenions are in inches
2. Units are constructed from HDPE plastic with U.V. inhibitors
3. Media cartridges can be interchanged with Geotrap series as site conditions change
4. Low profile cartridges are also available for shallow catch basins
5. Custom sizes are available to fit most applications
6. Optional trash and debris guard available
7. Dual stage and dual capacity cartridges also available



URBANGREEN™
Leave a Greener Footprint on Your Site

CONTECH®

First line of defense against trash in storm drain systems

800.338.1122 • www.contechcpi.com

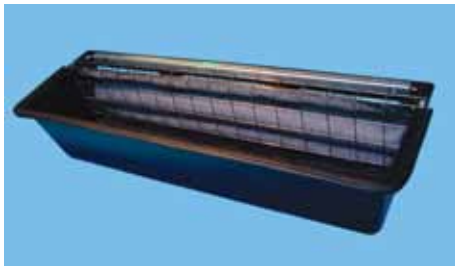
TRITON CATCH BASIN INSERTS

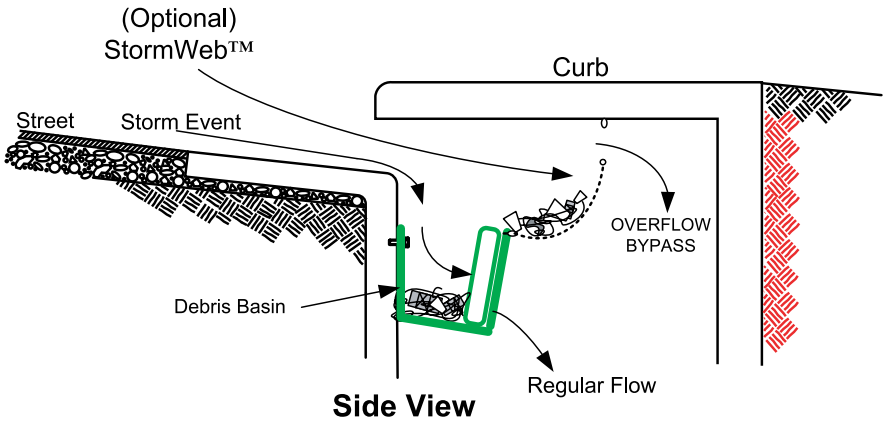
Triton Curb Inlet

The Triton Curb Inlet is designed to be inserted below the street/curb opening of storm drain inlets. It attaches to sides of catch basin using hardware supplied by manufacturer. Flow is designed to bypass insert in large storm events.

Specifications

- Easy to install in new and existing curb inlets
- Meets best available technology for use in stormwater best management practices (BMP)
- Non-reactive high impact polystyrene plastic construction with U.V. inhibitors. Over 40 percent of the plastic used comes from recycled content.
- Media-Paks cartridges available for the removal of sediments, hydrocarbons and litter
- Disposable Media-Pak is constructed from durable geotextile, polypropylene fabric
- Optional StormWeb™ system designed to assist in the removal of trash and debris, in compliance with TMDL requirements.
- Media-Pak may be removed through the curb opening for ease of maintenance





Side View

Standard Dimensions (in feet)

Model	A (curb opening)
TRC2	2.00
TRC2.5	2.50
TRC3	3.00
TRC3.5	3.50
TRC4	4.00
TRC5	5.00
TRC6	6.00
TRC7	7.00
TRC8	8.00
TRC9	9.00
TRC10	10.0
TRC12	12.00
TRC14	14.00
TRC21	21.00
TRC28	28.00

Notes:

1. All dimensions are in feet. Custom sizes also available.
2. Product is constructed of High Impact Polystyrene Plastic, with U.V. inhibitors. Over 40% recycled content.
3. Disposable Media-Pak is constructed of durable geotextile fabric, woven with perforated poly-propylene.
4. Media-Pak cage is constructed using 8 gauge Type 304 Stainless Steel.
5. Insert body is secured to inside wall using (2) 1/4" thick brackets per section, attached using 3/8" x 3" expansion anchor bolts.
6. Optional StormWeb™, designed for capturing larger trash and debris.
7. Media is non-hazardous per EPA and OSHA standards.
8. Insert shall be installed and maintained in accordance with manufacturer recommendations.

CONTECH®

800.338.1122
www.contechcpi.com

Get Social With Us!

Triton Drop-In Model Specification

PART 1.00 GENERAL

1.1 DESCRIPTION

A. Work included:
The Contractor, and/or a manufacturer selected by the Contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required and install all catch basin inserts in accordance with the drawings and these specifications.

B. The Triton Drop Inlet system is designed for use in stormdrains that experience oil and grease pollution accompanied by sediment, trash and debris. Trash, debris and sediment accumulate in the outer housing with oil and grease and fine particulates being trapped in the media cartridge. The system is a low cost best management practice (BMP) that helps meet National Pollutant Discharge Elimination System (NPDES) requirements with effective treatment, efficient installation and moderate maintenance.

1.2 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the work site after delivery, or at both places, and the sections shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the site shall be marked for identification and shall be removed from the site at once. All sections that have been damaged beyond repair during delivery will be rejected and, if already installed, shall be repaired to the Engineer's acceptance level, if permitted, or removed and replaced, entirely at the Contractor's expense.

PART 2.00 PRODUCTS

2.1 MATERIALS AND DESIGN

A. Insert Trough/Housing

1. Inserts are available to fit most industry standard catch basins. Custom sizes are available to fit most applications.

2. Standard insert troughs or housings shall be constructed of non-reactive high density polyethylene (HDPE) plastic with U.V. inhibitors. Larger units requiring greater structural support shall be constructed using fiberglass with Isophthalic polyester resin, which provides corrosion resistance needed for wet applications.

B. Exterior Cartridge Cage

1. The exterior cage of the cartridges shall be made of stainless steel Type 304, having 0.063 gauge welded 1" square openings.

C. Media-Pak Cartridges

1. Disposable media-pak cartridges shall be constructed of durable geo-textile polyethylene fabric.

2. Media-pak cartridges shall be easily removed from housing for maintenance.

D. Media and Media-Pak Combinations

1. A number of combinations can be set in place to obtain the most appropriate treatment level for the site.
   Option A – Standard: Includes media-pak (a durable geotextile polypropylene fabric) charged with XSORB® media for capture of hydrocarbons, oils and grease and sediment.
   Option B – Standard setup with cartridge pre-screen: Includes exterior cartridge housing fitted with a woven polypropylene geo-textile that is designed to capture smaller sediment (e.g., 850 microns).
   Option C – Dual stage media-pak charged with XSORB® media: Includes two media-pak staggered within a cartridge cage designed to target heavy hydrocarbon runoff areas.
   Option D – Dual stage media-pak with activated carbon: A standard media-pak is fitted on the outer interior of the cartridge housing with a second media-pak (charged with activated carbon) fitted behind the standard media-pak. The second media-pak is designed as a polishing media to remove pollutants found in runoff.

2. The media shall be non-biodegradable and non-hazardous per the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA).

3. Media shall be a treated perlite having hydrophobic properties.

E. Diverter Panels

1. If required, diverter panels or flow block material shall be ultra violet resistant high density polyethylene.

2.2 PERFORMANCE

Each standard Triton Drop Inlet model shall adhere to the following performance specifications.

Drop Inlet Model No.	Flange Outside Dimension (OD)	Trash and Debris Capacity (ft^3)	Treatment Capacity[1] (gpm)	Bypass Capacity* (gpm)
TR12RD	13”	0.193	70	830
TR1212	13”X13”	0.193	70	830
TR 16RD	18”	0.673	142	1,660
TR1616	18”X18”	0.673	142	1,660
TR18RD	20”	0.936	151	1,660
TR1818	20”X20”	0.936	151	3,103
TR1824	19”X25”	0.936	157	3,103
TR2024	21”X25”	0.936	157	3,103
TR24RD	26”	1.070	299	4,261
TR24SR	26”X26”	1.070	299	4,261
TR2436	26”X40”	1.570	345	6,206
TR2448	26”X52”	2.140	572	8,522
TR3030	33”X33”	1.570	345	6,206
TR3636	40”X40”	8,430	690	12,412
TR36RD	40”	8.430	690	12,412
TR4848	52”X52”	15.500	1,196	17,044

* Bypass capacity is estimated as circular weir flow and is a function of the available head (inside top of structure to the overflow crest of the cartridge) and crest length. Typically, the bypass capacity should be less restrictive than the inlet grate of the catch basin.

[1] – Treatment capacity based on standard media-pak configuration (Option A).

2.3 MANUFACTURER

The manufacturer of said system shall have been regularly engaged in the engineering design and production of systems for the physical treatment of stormwater runoff for 10 years minimum. Each catch basin insert shall be supplied by CONTECH Stormwater Solutions Inc., 9025 Centre Pointe Drive, Suite 400, West Chester, OH 45069, phone 1-866-551-8325.

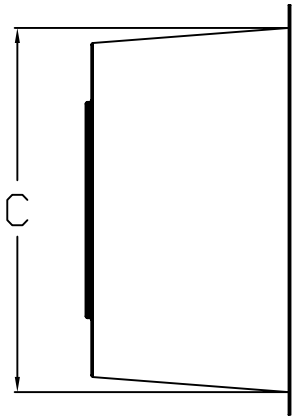
PART 3.00 EXECUTION

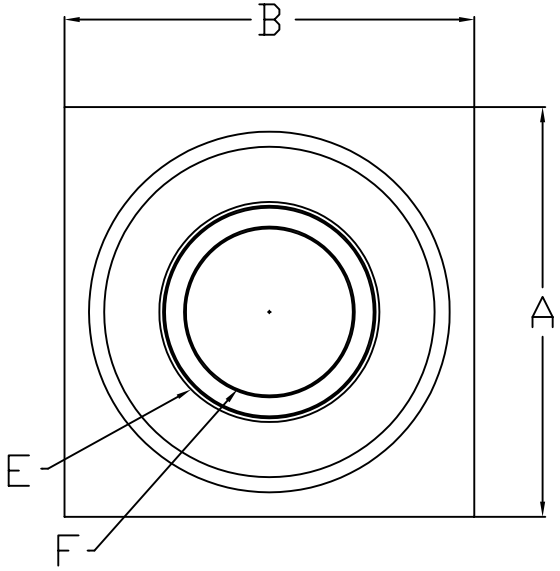
3.1 INSTALLATION

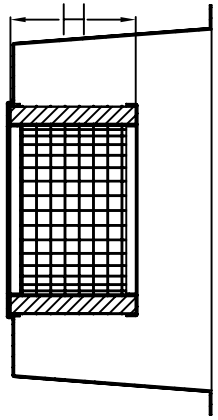
A. Each stormwater treatment system shall be constructed according to The dimensions shown on the Drawings and as specified herein. Install at elevations and locations shown on the Drawings or as otherwise directed by the Engineer.

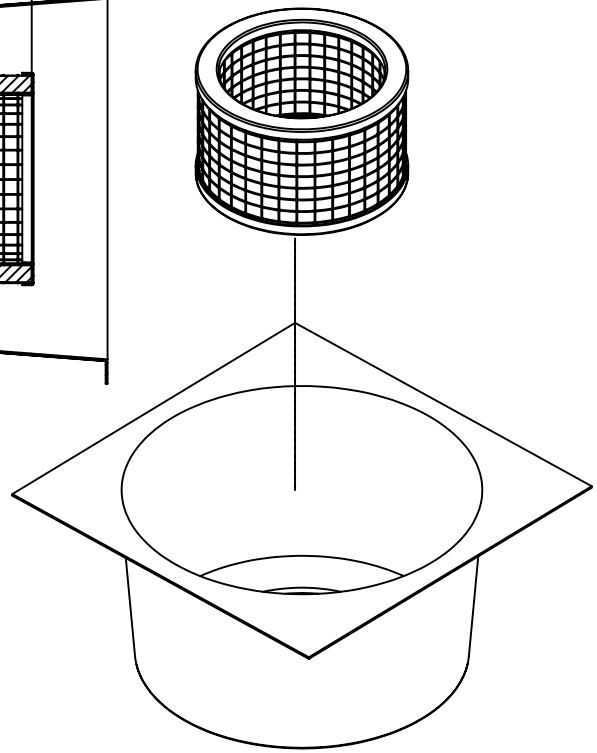
B. If required in most cases, the housing flange can be cut in the field using a skill-saw or other saw blade to fit the grate frame.

NOTES
1. ALL DIMENSION ARE IN INCHES UNLESS OTHERWISE NOTED
2. UNITS ARE CONTRUCTED FROM HIGH DENSITY POLYETHYLENE PLASTIC WITH UV INHIBITORS OR FIBERGLASS HAVING ISOPHTHALIC POLYESTER RESINS THAT ARE GEL COATED WITH ISO?NPG
3. MEDIA CARTRIDGES CAN BE INTERCHANGED WITH GEOTRAP SERIES AS SITE CONDITIONS CHANGE.
4. LOW PROFILE FILTER ARE ALSO AVAILABLE FOR SHALLOW CATCH BASINS.
5. CUSTOM SIZES ARE AVAILABLE TO FIT MOST APPLICATIONS. PLEASE CALL A LOCAL CONTECH OFFICE NEAR YOU FOR DETAILS.
6. OPTIONAL TRASH GUARD AVAILABLE.
7. DUAL STAGE AND DUAL CAPACITY FILTERS ALSO AVAILABLE FOR LARGER DEBRIS CAPACITIES
8. * DIMENSIONS "A" AND "B" SUPPORT FLANGES CAN BE ADJUSTED TO SUITE VARYING SIZES OF CATCH BASINS
9. CUSTOM INSTALL BRACKETS ARE AVAILABLE AS NEEDED.

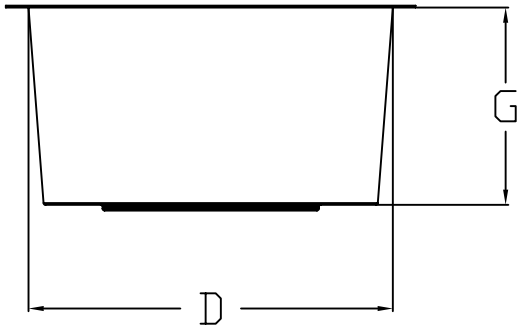








MODEL #	A*	B*	C	D	E	F	G	# CARTRIDGES	H	BASIN TYPE
TR1212	15.00	15.00	11.00	11.00	6.75	3.50	6.0	1 SHORT	4.5	HDPE
TR12RD	Ø15.00		Ø11.00		6.75	3.50	6.0	1 SHORT	4.5	HDPE
TR1616	20.00	20.00	14.00	14.00	6.75	3.50	10.5	1 STD	8.5	HDPE
TR16RD	Ø20.00		Ø11.00		6.75	3.50	6.0	1 SHORT	4.5	HDPE
TR1818	24.00	24.00	18.00	18.00	10.0	6.25	10.5	1 STD	8.5	HDPE
TR18RD	Ø24.00		Ø16.50		6.75	3.50	10.5	1 STD	8.5	HDPE
TR1824	19.00	25.00	18.00	18.00	10.0	6.25	10.5	1 STD	8.5	HDPE
TR2024	21.00	25.00	18.00	18.00	10.0	6.25	10.5	1 STD	8.5	HDPE
TR24SR	27.00	27.00	23.50	23.50	14.0	10.0	13.0	1 STD	8.5	HDPE
TR24RD	Ø28.00		Ø21.00		14.0	10.0	13.0	1 STD	8.5	HDPE
TR2436	32.00	40.00	22.00	29.00	14.0	10.0	21.0	1 TALL	16.5	HDPE
TR3030	34.00	34.00	22.00	29.00	14.0	10.0	21.0	1 TALL	16.5	HDPE
TR36SR	36.00	36.00	33.00	33.00	14.0	10.0	22.0	1 TALL	16.5	FIBRG
TR36RD	Ø36.00		Ø33.00		14.0	10.0	22.0	1 TALL	16.5	FIBRG
TR42RD	Ø42.00		Ø33.00		14.0	10.0	22.0	1 TALL	16.5	FIBRG
TR4848	48.00	48.00	42.00	42.00	24.0	19.75	22.0	1 TALL	17.5	FIBRG
TR48RD	Ø48.00		Ø33.00		14.0	10.0	22.0	1 TALL	16.5	FIBRG



TYPICAL DETAIL FOR DROP INLET STYLE
TRITON CATCHBASIN INSERTS BY CONTECH

REVISIONS	
REV	DESCRIPTION

CONTECH STORMWATER SOLUTIONS
contechstormwater.com

SCALE: NONE
DRAWN: WSG
CHECKED: WSG
FILE NAME: TYPTBLTCBI
DATE: 8/12/09